ISSN (print) 0093-4666 © 2015. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/130.647

Volume 130, pp. 647–651 *July–September 2015*

New reports of rust fungi from Malakand, Khyber Pakhtunkhwa, Pakistan

S. Hussain[1], H. Ahmad[1], N.S. Afshan[3]*, & A.N. Khalid[2]

[1]*Department of Genetics, Hazara University, Mansehra, Pakistan*
[2]*Department of Botany &*[3]**Centre for Undergraduate Studies,*
University of the Punjab, Quaid-e-Azam Campus, Lahore, 54590, Pakistan
*Correspondence to: *pakrust@gmail.com*

Abstract — *Puccinia microspora* and *P. nakanishikii* were collected from Malakand district, Khyber Pakhtunkhwa and are new records for Pakistan.

Key words — Hazar Nao, Swat, *Uredinales*

Introduction

The tribal region, Malakand is located at 34°35¢N 71°57¢E. It is bounded by Dir and Swat, by Buner, Mardan, and Charsadda districts, and by Mohmand and Bajaur Agencies (Chaghtai & Ghawas 1976). Malakand extends from the rugged and partly glaciated mountain ranges of the Hindukush down to northern edge of the Peshawar basin. Vegetation of the district is mostly sub-tropical, typified as Coniferous Sub-tropical Pine Forest of Pakistan (Sheikh 1993). The dominant forest trees are *Pinus roxburghii* Sarg. mixed with *Quercus oblongata* D. Don [= *Q. incana* Roxb.] and *Olea ferruginea* Royle, and *Acacia modesta* Wall. and *Dodonaea viscosa* Jacq. are found at the lower elevations (Barkatullah & Ibrar 2011).

During the exploration of *Uredinales* of Malakand, Pakistan, rust infected plants were collected from different localities and examined macro-microscopically. Among the specimens, *Puccinia microspora* and *P. nakanishikii* were found as new records for Pakistan. Previously about 174 species of rust fungi have been reported from Khyber Pakhtunkhwa (Afshan & Khalid 2008, 2009; Afshan et al. 2008a,b,c,d, 2010; Ishaq et al. 2013; Fiaz et al. 2015), but Malakand district is totally unexplored uredinologically. So this is a first attempt to study and explore this floristically rich area with respect to rust fungi.

Materials & methods

Freehand sections & scrape mounts of infected plant materials were made in lactic acid. The plants were photographed and infected portions were observed under a stereomicroscope. Twenty spores representing each spore state were examined under a Nikon YS 100 microscope, and paraphyses and spore were measured using a Zeiss eyepiece screw micrometer. Sections, paraphyses and spores were microphotographed by Digiporo-Labomed. Spores and paraphyses were drawn with the aid of a camera lucida (Ernst Leitz Wetzlar Germany). Specimens are conserved in the Herbarium, Hazara University, Dhodial, Pakistan (HUP).

New records

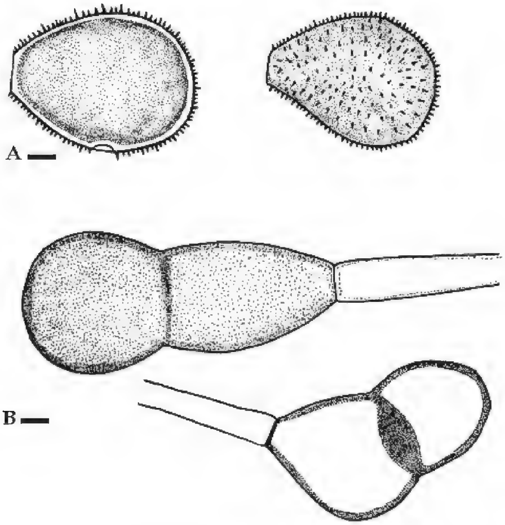

Plate 1: *Puccinia microspora* (HUP SHR-25):
A. Urediniospores. B. Teliospores. Scale bars = 10 µm.

Puccinia microspora Dietel, Bot. Jahrb. Syst. 37: 101 (1905) Plate 1

Spermogonia and aecia not found. Sori frequent on the abaxial surface. Uredinia pale brown to cinnamon brown. Urediniospores 22.5–26 × 17–20 µm, oval to obovoid, cinnamon brown, echinulate, 3–4 equatorial germ pores, wall thickness 1.7–2.3 µm. Telia dark brown to blackish brown. Teliospores 33–39 × 20.5–25 µm, smooth, chestnut brown, wall thickness 2–3 µm, pale brown; pedicels 22–26 µm, thin walled, persistent.

Material examined: PAKISTAN, Khyber Pakhtunkhwa, District Malakand, Qaldara, at 510 m a.s.l., on *Imperata cylindrica* (L.) P. Beauv. (*Poaceae*), stages II + III, April, 2014, S. Hussain SHR-208. (HUP SHR-25).

COMMENTS: *Puccinia microspora* is a new record for Pakistan. This fungus previously been reported from Asia, North America, and South America (Cummins 1971, Bagyanarayana & Ravinder 1988).

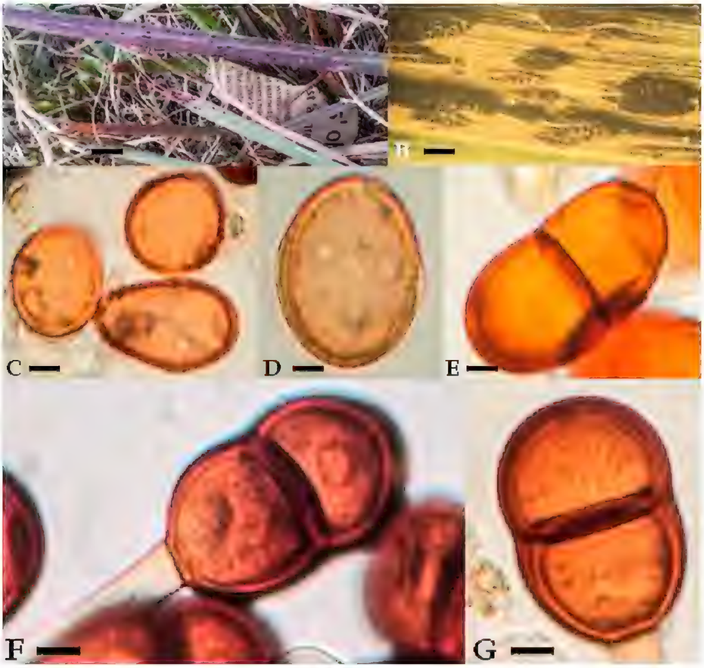

PLATE 2A–G: *Puccinia nakanishikii* (HUP SHR-26): A. Host plant. B. Uredinial and telial sori under stereomicroscope. C, D. Urediniospores. E–G. Teliospores. Scale bars: A, B = 10 mm; C, D = 10 µm; E–G = 12 µm.

Puccinia nakanishikii Dietel, Bot. Jahrb. Syst. 34: 585 (1905) PLATE 2

SPERMOGONIA and AECIA unknown. Uredinial and telial sori amphigenous. UREDINIA light brown to cinnamon-brown, rounded to globose. UREDINIOSPORES 25–30 × 18–24 µm, globose to ellipsoid, echinulate, light brown to chestnut brown, 4–5 equatorial germ pores, wall thickness 1–2.5 µm. TELIA sub-epidermal but early exposed, dark brown to blackish, elongated, 0.2–0.5 mm. TELIOSPORES 32–38 × 20–26 µm, chestnut brown to dark brown, ellipsoidal, smooth with little granular contents, wall thickness at sides 2.3–3.5 µm, and 4–6 µm apically. Pedicel usually persistent, light brown, thick walled, 94–111 × 5–7 µm.

MATERIAL EXAMINED: PAKISTAN, KHYBER PAKHTUNKHWA, District Malakand, Jaban, at 490 m a.s.l., on *Sorghum halepense* (L.) Pers. (*Poaceae*), stages II + III, Nov. 2010, S. Hussain SHR-209. (HUP SHR-26).

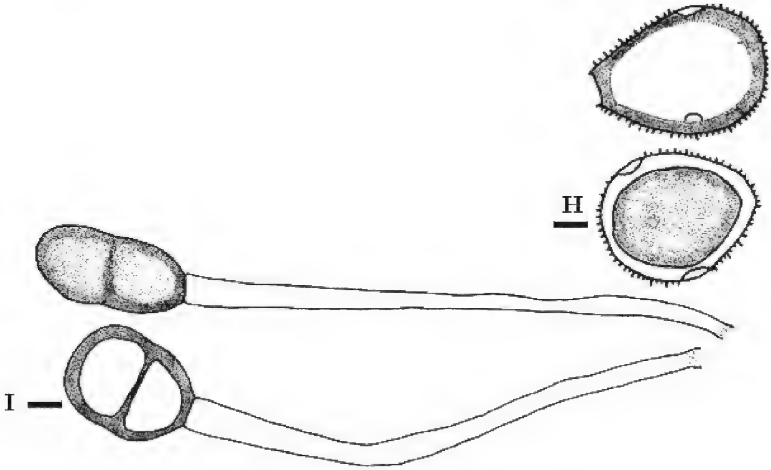

Plate 2h–i: *Puccinia nakanishikii* (HUP SHR-26):
H. Urediniospores. I. Teliospores. Scale bars = 10 µm.

Comments: *Puccinia nakanishikii* is a new record for Pakistan. It has previously been reported from Africa and Asia on the grass genera *Andropogon*, *Bothriochloa*, *Capillipedium*, *Cymbopogon*, and *Sorghum* (Cummins 1971).

Acknowledgements

We sincerely thank Dr. Abdul Rehman Niazi (Department of Botany, University of the Punjab, Lahore, Pakistan) and Dr. Omar Paíno Perdomo (Dominican Society of Mycology, Santo Domingo, Dominican Republic) for their valuable suggestions to improve the manuscript and acting as presubmission reviewers.

Literature cited

Afshan NS, Khalid AN. 2008. New rust fungi on noxious weeds from Pakistan. Pakistan Journal of Phytopathology 20(1): 82–87.

Afshan NS, Khalid AN. 2009. New records of *Puccinia* and *Pucciniastrum* from Pakistan. Mycotaxon 108: 137–146. http://dx.doi.org/10.5248/108.137

Afshan NS, Khalid AN, Niazi AR. 2008a. New records and distribution of rust fungi from Pakistan. Mycotaxon 105: 257–267.

Afshan NS, Khalid AN, Niazi AR. 2008b. New records of graminicolous rust fungi from Pakistan. Pakistan Journal of Botany 40(3): 1279–1283.

Afshan NS, Khalid AN, Javed H. 2008c. Further addition to the rust flora of Pakistan. Pakistan Journal of Botany 40(3): 1285–1289.

Afshan NS, Berndt R, Khalid AN, Niazi AR. 2008d. New graminicolous rust fungi from Pakistan. Mycotaxon 104: 123–130.

Afshan NS, Niazi AR, Khalid AN. 2010. Three new species of rust fungi from Pakistan. Mycological Progress 9: 485–490. http://dx.doi.org/10.1007/s11557-010-0655-8

Bagyanarayana G, Ravinder EJ. 1988. *Puccinia microspora* Diet. (*Uredinales*)--a new record for India from Andhra Pradesh State. Acta Botanica Indica 16(1): 101–102.

Barkatullah, Ibrar M. 2011. Plants profile of Malakand Pass Hills, District Malakand, Pakistan. African Journal of Biotechnology 10(73): 16521–16535. http://dx.doi.org/10.5897/AJB11.1258

Chaghtai SM, Ghawas IH. 1976. The study of the effect of exposure on community setup in Malakand Pass, NWFP., Pakistan. Sultania 2: 1–8.

Cummins GB. 1971. The rust fungi of cereals, grasses and bamboos. Springer, New York. http://dx.doi.org/10.1007/978-3-642-88451-1

Fiaz M, Habib A, Afshan NS, Khalid AN. 2015. Some new records of *Uredinales* from Khyber Pakhtunkhwa, Pakistan. Mycotaxon 130(2): 569–575. http://dx.doi.org/10.5248/130.569

Ishaq A, Afshan NS, Khalid AN. 2013. New records of *Puccinia* on *Poaceae* from Khyber Pakhtunkhwa, Pakistan. Mycotaxon 126: 177–182. http://dx.doi.org/10.5248/126.177

Sheikh MI. 1993. Trees of Pakistan. Pictorial Printers (Pvt.) Ltd., Islamabad, Pakistan.